

6 183. (New) The fuel cell electrode of claim 178 wherein said electrocatalyst comprises a metal selected from the group consisting of Ti, Zr, Hf, V, Nb, Ta, Cr, Mo, W, Mn, Tc, Re, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Ni, Pd, and Pt.

7 184. (New) The fuel cell electrode of claim 178 wherein said electrocatalyst comprises a metal selected from the group consisting of Ni, Pd, and Pt.

8 185. (New) The fuel cell electrode of claim 181 wherein said electrocatalyst comprises a metal selected from the group consisting of Ti, Zr, Hf, V, Nb, Ta, Cr, Mo, W, Mn, Tc, Re, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Ni, Pd, and Pt.

9 186. (New) The fuel cell electrode of claim 181 wherein said electrocatalyst comprises a metal selected from the group consisting of Ni, Pd, and Pt.

10 187. (New) A fuel cell electrode comprising a support comprising a deposit disposed thereon, said deposit comprising a catalytically effective load of an electrocatalyst comprising at least one noble metal and comprising an electrocatalytic active area at least in part comprising rod-shaped structures of said at least one noble metal.

11 188. (New) The fuel cell electrode of claim 187 wherein said rod-like structures are visible at a magnification of at least about x10k.

12 189. (New) The fuel cell electrode of claim 187 wherein said deposit further comprises particles of said electrocatalyst comprising an outer surface, wherein said electrocatalytic active area comprises a majority of said outer surface of said particles.

13 190. (New) The fuel cell electrode of claim 188 wherein said deposit further comprises particles of said electrocatalyst comprising an outer surface, wherein said electrocatalytic active area comprises a majority of said outer surface of said particles.

14 191. (New) The fuel cell electrode of claim 187 wherein said electrocatalyst comprises platinum.

15 192. (New) The fuel cell electrode of claim 190 wherein said electrocatalyst comprises platinum.

16 193. (New) The fuel cell electrode of claim 187 wherein said electrocatalyst consists essentially of platinum.

17 194. (New) The fuel cell electrode of claim 190 wherein said electrocatalyst consists essentially of platinum.

195. (New) The fuel cell electrode of claim 187 wherein, at a cell potential of about 0.6 V, an MEA containing said fuel cell electrode as a half cell operating as a cathode yields a power output of about 800 mA cm^{-2} or greater.

196. (New) The fuel cell electrode of claim 190 wherein, at a cell potential of about 0.6 V, an MEA containing said fuel cell electrode as a half cell operating as a cathode yields a power output of about 800 mA cm^{-2} or greater.

197. (New) The fuel cell electrode of claim 191 wherein, at a cell potential of about 0.6 V, an MEA containing said fuel cell electrode as a half cell operating as a cathode yields a power output of about 800 mA cm^{-2} or greater.

198. (New) The fuel cell electrode of claim 192 wherein, at a cell potential of about 0.6 V, an MEA containing said fuel cell electrode as a half cell operating as a cathode yields a power output of about 800 mA cm^{-2} or greater.

199. (New) The fuel cell electrode of claim 193 wherein, at a cell potential of about 0.6 V, an MEA containing said fuel cell electrode as a half cell operating as a cathode yields a power output of about 800 mA cm^{-2} or greater.

200. (New) The fuel cell electrode of claim 194 wherein, at a cell potential of about 0.6 V, an MEA containing said fuel cell electrode as a half cell operating as a cathode yields a power output of about 800 mA cm^{-2} or greater.

201. (New) The fuel cell electrode of claim 191 wherein said load comprises less than about 0.3 mg/cm^2 of said platinum.

202. (New) The fuel cell electrode of claim 191 herein said load comprises less than about 0.2 mg/cm^2 of said platinum.

203. (New) The fuel cell electrode of claim 191 wherein said load comprises from about 0.01 to about 0.2 mg/cm^2 of said platinum.

204. (New) The fuel cell electrode of claim 191 wherein said load is about 0.01 mg/cm^2 or less of said platinum.

205. (New) The fuel cell electrode of claim 192 wherein said load comprises less than about 0.3 mg/cm^2 of said platinum.

206. (New) The fuel cell electrode of claim 192 herein said load comprises less than about 0.2 mg/cm^2 of said platinum.

30 207. (New) The fuel cell electrode of claim 192 wherein said load comprises from about 0.01 to about 0.2 mg/cm² of said platinum. 15

31 208. (New) The fuel cell electrode of claim 192 wherein said load is about 0.01 mg/cm² or less of said platinum. 15

32 209. (New) The fuel cell electrode of claim 197 wherein said load comprises less than about 0.3 mg/cm² of said platinum. 20

33 210. (New) The fuel cell electrode of claim 197 herein said load comprises less than about 0.2 mg/cm² of said platinum. 20

34 211. (New) The fuel cell electrode of claim 197 wherein said load comprises from about 0.01 to about 0.2 mg/cm² of said platinum. 20

35 212. (New) The fuel cell electrode of claim 197 wherein said load is about 0.01 mg/cm² or less of said platinum. 20

36 213. (New) The fuel cell electrode of claim 198 wherein said load comprises less than about 0.3 mg/cm² of said platinum. 21

37 214. (New) The fuel cell electrode of claim 198 herein said load comprises less than about 0.2 mg/cm² of said platinum. 21

38 215. (New) The fuel cell electrode of claim 198 wherein said load comprises from about 0.01 to about 0.2 mg/cm² of said platinum. 21

39 216. (New) The fuel cell electrode of claim 198 wherein said load is about 0.01 mg/cm² or less of said platinum. 14

40 217. (New) The fuel cell electrode of claim 191 wherein said support has a surface area, and said deposit covers about 300 cm² or more of said surface area. 18

41 218. (New) The fuel cell electrode of claim 195 wherein said support has a surface area, and said deposit covers about 300 cm² or more of said surface area. 19

42 219. (New) The fuel cell electrode of claim 196 wherein said support has a surface area, and said deposit covers about 300 cm² or more of said surface area. 20

43 220. (New) The fuel cell electrode of claim 197 wherein said support has a surface area, and said deposit covers about 300 cm² or more of said surface area. 21

44 221. (New) The fuel cell electrode of claim 198 wherein said support has a surface area, and said deposit covers about 300 cm² or more of said surface area.

45 222. (New) The fuel cell electrode of claim 199²² wherein said support has a surface area, and said deposit covers about 300 cm² or more of said surface area.

46 223. (New) The fuel cell electrode of claim 200²³ wherein said support has a surface area, and said deposit covers about 300 cm² or more of said surface area.

47 224. (New) The fuel cell electrode of claim 187¹⁰ wherein said support has a surface area; and, substantially all of said surface area ionically communicates with an ionomeric membrane.

48 225. (New) The fuel cell electrode of claim 190¹³ wherein said support has a surface area; and, substantially all of said surface area ionically communicates with an ionomeric membrane.

49 226. (New) The fuel cell electrode of claim 197²⁰ wherein said support has a surface area; and, substantially all of said surface area ionically communicates with an ionomeric membrane.

50 227. (New) The fuel cell electrode of claim 198²¹ wherein said support has a surface area; and, substantially all of said surface area ionically communicates with an ionomeric membrane.

51 228. (New) The fuel cell electrode of claim 225⁴⁸ wherein substantially all of said surface area ionically communicates with an ionomeric membrane.

52 229. (New) The fuel cell electrode of claim 226⁴⁹ wherein substantially all of said surface area ionically communicates with an ionomeric membrane.

53 230. (New) The fuel cell electrode of claim 227⁵⁰ wherein substantially all of said surface area ionically communicates with an ionomeric membrane.

54 231. (New) A membrane electrode assembly comprising the fuel cell electrode of claim 224.⁴⁷

55 232. (New) A membrane electrode assembly comprising the fuel cell electrode of claim 227.⁵⁰

233. (New) A fuel cell electrode comprising a support comprising a deposit disposed thereon, said deposit comprising a catalytically effective load of an electrocatalyst comprising platinum and comprising an electrocatalytic active area at least in part comprising rod-shaped structures of said electrocatalyst, wherein at a cell potential of about 0.6 V, an MEA containing said fuel cell electrode as a half cell operating as a cathode yields a power output of about 800 mA cm^{-2} or greater.

234. (New) The fuel cell electrode of claim 233 wherein said rod-like structures are visible at a magnification of at least about $\times 10k$.

235. (New) The fuel cell electrode of claim 233 wherein said deposit further comprises particles of said electrocatalyst comprising an outer surface, wherein said electrocatalytic active area comprises a majority of said outer surface of said particles.

236. (New) The fuel cell electrode of claim 234 wherein said deposit further comprises particles of said electrocatalyst comprising an outer surface, wherein said electrocatalytic active area comprises a majority of said outer surface of said particles.

237. (New) The fuel cell electrode of claim 233 wherein said support is a carbon catalyst support.

238. (New) The fuel cell electrode of claim 236 wherein said support is a carbon catalyst support.

239. (New) The fuel cell electrode of claim 233 wherein said load comprises less than about 0.3 mg/cm^2 of said platinum.

240. (New) The fuel cell electrode of claim 233 wherein said load comprises less than about 0.2 mg/cm^2 of said platinum.

241. (New) The fuel cell electrode of claim 233 wherein said load comprises from about 0.01 to about 0.2 mg/cm^2 of said platinum.

242. (New) The fuel cell electrode of claim 233 wherein said load is about 0.01 mg/cm^2 or less of said platinum.

243. (New) The fuel cell electrode of claim 237 wherein said load comprises less than about 0.3 mg/cm^2 of said platinum.

244. (New) The fuel cell electrode of claim 237 wherein said load comprises less than about 0.2 mg/cm^2 of said platinum.

68 245. (New) The fuel cell electrode of claim 237 wherein said load comprises from about 0.01 to about 0.2 mg/cm² of said platinum.

69 246. (New) The fuel cell electrode of claim 237 wherein said load is about 0.01 mg/cm² or less of said platinum.

70 247. (New) The fuel cell electrode of claim 238 wherein said load comprises less than about 0.3 mg/cm² of said platinum.

71 248. (New) The fuel cell electrode of claim 238 wherein said load comprises less than about 0.2 mg/cm² of said platinum.

72 249. (New) The fuel cell electrode of claim 238 wherein said load comprises from about 0.01 to about 0.2 mg/cm² of said platinum.

73 250. (New) The fuel cell electrode of claim 238 wherein said load is about 0.01 mg/cm² or less of said platinum.

74 251. (New) The fuel cell electrode of claim 233 wherein said support has a surface area, and said deposit covers about 300 cm² or more of said surface area.

75 252. (New) The fuel cell electrode of claim 237 wherein said support has a surface area, and said deposit covers about 300 cm² or more of said surface area.

76 253. (New) The fuel cell electrode of claim 238 wherein said support has a surface area, and said deposit covers about 300 cm² or more of said surface area.

77 254. (New) The fuel cell electrode of claim 244 wherein said support has a surface area, and said deposit covers about 300 cm² or more of said surface area.

78 255. (New) The fuel cell electrode of claim 248 wherein said support has a surface area, and said deposit covers about 300 cm² or more of said surface area.

79 256. (New) The fuel cell electrode of claim 237 wherein said support has a surface area; and,

substantially all of said surface area ionically communicates with an ionomeric membrane.

80 257. (New) The fuel cell electrode of claim 238 wherein said support has a surface area; and,

substantially all of said surface area ionically communicates with an ionomeric membrane.

81 258. (New) The fuel cell electrode of claim 248

said support has a surface area; and,

substantially all of said surface area ionically communicates with an ionomeric membrane.

82 259. (New) The fuel cell electrode of claim 255 wherein said support has a surface area; and,

substantially all of said surface area ionically communicates with an ionomeric membrane.

83 260. (New) The fuel cell electrode of claim 256 wherein said ionomeric membrane comprises a composite of polytetrafluoroethylene comprising impregnated ion exchange media.

84 261. (New) The fuel cell electrode of claim 260 wherein said composite comprises a thickness of about 1 μm .

85 262. (New) The fuel cell electrode of claim 261 wherein said ionomeric membrane comprises a composite of polytetrafluoroethylene comprising impregnated ion exchange media.

86 263. (New) The fuel cell electrode of claim 262 wherein said composite comprises a thickness of about 1 μm .

87 264. (New) The fuel cell electrode of claim 263 wherein said ionomeric membrane comprises a composite of polytetrafluoroethylene comprising impregnated ion exchange media.

88 265. (New) The fuel cell electrode of claim 264 wherein said composite comprises a thickness of about 1 μm .

89 266. (New) The fuel cell electrode of claim 265 wherein said ionomeric membrane comprises a composite of polytetrafluoroethylene comprising impregnated ion exchange media.

90 267. (New) The fuel cell electrode of claim 266 wherein said composite comprises a thickness of about 1 μm .

91 268. (New) The fuel cell electrode of claim 267 wherein said ionomeric membrane comprises a composite of polytetrafluoroethylene comprising impregnated ion exchange media.

92 269. (New) The fuel cell electrode of claim 268 wherein said composite comprises a thickness of about 1 μm .

93 270. (New) A membrane electrode assembly comprising the fuel cell electrode of claim 232. 55

94 271. (New) A membrane electrode assembly comprising the fuel cell electrode of claim 268. 91

95 272. (New) A fuel cell electrode comprising a support comprising a deposit disposed thereon, said deposit comprising a catalytically effective load of an electrocatalyst comprising less than about 0.2 mg/cm² platinum, and comprising an electrocatalytic active area at least in part comprising rod-shaped structures of said electrocatalyst, wherein said support has a surface area, and said deposit covers about 300 cm² or more of said surface area, wherein, at a cell potential of about 0.6 V, an MEA containing said fuel cell electrode as a half cell operating as a cathode yields a power output of about 800 mA cm⁻² or greater.

96 273. (New) The fuel cell electrode of claim 272 wherein said rod-like structures are visible at a magnification of at least about $\times 10\text{k}$.

97 274. (New) The fuel cell electrode of claim 272 wherein said deposit further comprises particles of said electrocatalyst comprising an outer surface, wherein said electrocatalytic active area comprises a majority of said outer surface of said particles.

98 275. (New) The fuel cell electrode of claim 273 wherein said deposit further comprises particles of said electrocatalyst comprising an outer surface, wherein said electrocatalytic active area comprises a majority of said outer surface of said particles.

99 276. (New) The fuel cell electrode of claim 272 wherein said support is a carbon catalyst support.

100 277. (New) The fuel cell electrode of claim 275 wherein said support is a carbon catalyst support.

101 278. (New) The fuel cell electrode of claim 272 wherein said support has a surface area; and, substantially all of said surface area ionically communicates with an ionomeric membrane.

102 279. (New) The fuel cell electrode of claim 275 wherein

said support has a surface area; and,

substantially all of said surface area ionically communicates with an ionomeric membrane.

103 280. (New) The fuel cell electrode of claim 276 wherein said support has a surface area; and,

substantially all of said surface area ionically communicates with an ionomeric membrane.

104 281. (New) The fuel cell electrode of claim 277 wherein said carbon catalyst support comprises a material selected from the group consisting of a carbon filament bundle, reticulated carbon, carbon cloth, and carbon mesh.

105 282. (New) The fuel cell electrode of claim 277 wherein said carbon catalyst support comprises a material selected from the group consisting of a carbon cloth and a coating on a carbon cloth selected from the group consisting of carbon, a wet proofing material, and a combination thereof.

106 283. (New) The fuel cell electrode of claim 278 wherein said ionomeric membrane comprises a composite of polytetrafluoroethylene comprising impregnated ion exchange media.

107 284. (New) The fuel cell electrode of claim 283 wherein said composite comprises a thickness of about 1 μm .

108 285. (New) The fuel cell electrode of claim 279 wherein said ionomeric membrane comprises a composite of polytetrafluoroethylene comprising impregnated ion exchange media.

109 286. (New) The fuel cell electrode of claim 285 wherein said composite comprises a thickness of about 1 μm .

110 287. (New) The fuel cell electrode of claim 280 wherein said ionomeric membrane comprises a composite of polytetrafluoroethylene comprising impregnated ion exchange media.

111 288. (New) The fuel cell electrode of claim 287 wherein said composite comprises a thickness of about 1 μm .

112 289. (New) A membrane electrode assembly comprising the fuel cell electrode of claim 272.

113 290. (New) A membrane electrode assembly comprising the fuel cell electrode of claim 288. 111

114 291. (New) A fuel cell electrode comprising a support comprising a deposit disposed thereon, said deposit comprising a catalytically effective load of platinum, and comprising an electrocatalytic active area at least in part comprising rod-shaped structures of said platinum.

115 292. (New) The fuel cell electrode of claim 291 wherein said rod-like structures are visible at a magnification of at least about x10k.

116 293. (New) The fuel cell electrode of claim 291 wherein said deposit further comprises particles of said electrocatalyst comprising an outer surface, wherein said electrocatalytic active area comprises a majority of said outer surface of said particles.

117 294. (New) The fuel cell electrode of claim 292 wherein said deposit further comprises particles of said electrocatalyst comprising an outer surface, wherein said electrocatalytic active area comprises a majority of said outer surface of said particles.

118 295. (New) The fuel cell electrode of claim 291 wherein said support is a carbon catalyst support.

119 296. (New) The fuel cell electrode of claim 294 wherein said support is a carbon catalyst support.

120 297. (New) The fuel cell electrode of claim 291 wherein said support has a surface area; and, substantially all of said surface area ionically communicates with an ionomeric membrane.

121 298. (New) The fuel cell electrode of claim 295 wherein said support has a surface area; and, substantially all of said surface area ionically communicates with an ionomeric membrane.

122 299. (New) The fuel cell electrode of claim 296 wherein said support has a surface area; and, substantially all of said surface area ionically communicates with an ionomeric membrane.

123 300. (New) The fuel cell electrode of claim 296 wherein said carbon catalyst support comprises a material selected from the group consisting of a carbon filament bundle, reticulated carbon, carbon cloth, and carbon mesh.

124 301. (New) The fuel cell electrode of claim 296 wherein said carbon catalyst support comprises a material selected from the group consisting of a carbon cloth and a coating on a carbon cloth selected from the group consisting of carbon, a wet proofing material, and a combination thereof.

125 302. (New) The fuel cell electrode of claim 297 wherein said ionomeric membrane comprises a composite of polytetrafluoroethylene comprising impregnated ion exchange media.

126 303. (New) The fuel cell electrode of claim 302 wherein said composite comprises a thickness of about 1 μm .

127 304. (New) The fuel cell electrode of claim 298 wherein said ionomeric membrane comprises a composite of polytetrafluoroethylene comprising impregnated ion exchange media.

128 305. (New) The fuel cell electrode of claim 304 wherein said composite comprises a thickness of about 1 μm .

129 306. (New) The fuel cell electrode of claim 299 wherein said ionomeric membrane comprises a composite of polytetrafluoroethylene comprising impregnated ion exchange media.

130 307. (New) The fuel cell electrode of claim 306 wherein said composite comprises a thickness of about 1 μm .

131 308. (New) A membrane electrode assembly comprising the fuel cell electrode of claim 291.

132 309. (New) A membrane electrode assembly comprising the fuel cell electrode of claim 307.

133 310. (New) A fuel cell electrode comprising a support comprising a deposit disposed thereon, said deposit comprising a catalytically effective load of platinum, and comprising an electrocatalytic active area at least in part comprising rod-shaped structures of said platinum. wherein said support has a surface area, and said deposit covers about 300 cm^2 or more of said surface area, wherein, at a cell potential of about

84 0.6 V, an MEA containing said fuel cell electrode as a half cell operating as a cathode yields a power output of about 800 mA cm^{-2} or greater.

134 311. (New) The fuel cell electrode of claim 310 wherein said rod-like structures are visible at a magnification of at least about $\times 10k$.

135 312. (New) The fuel cell electrode of claim 310 wherein said deposit further comprises particles of said electrocatalyst comprising an outer surface, wherein said electrocatalytic active area comprises a majority of said outer surface of said particles.

136 313. (New) The fuel cell electrode of claim 311 wherein said deposit further comprises particles of said electrocatalyst comprising an outer surface, wherein said electrocatalytic active area comprises a majority of said outer surface of said particles.

137 314. (New) The fuel cell electrode of claim 310 wherein said electrocatalyst consists essentially of platinum.

138 315. (New) The fuel cell electrode of claim 313 wherein said electrocatalyst consists essentially of platinum.

139 316. (New) The fuel cell electrode of claim 310 wherein said support is a carbon catalyst support.

140 317. (New) The fuel cell electrode of claim 313 wherein said support is a carbon catalyst support.

141 318. (New) The fuel cell electrode of claim 314 wherein said support is a carbon catalyst support.

142 319. (New) The fuel cell electrode of claim 315 wherein said support is a carbon catalyst support.

143 320. (New) The fuel cell electrode of claim 310 wherein said support has a surface area; and, substantially all of said surface area ionically communicates with an ionomeric membrane.

144 321. (New) The fuel cell electrode of claim 316 wherein said support has a surface area; and, substantially all of said surface area ionically communicates with an ionomeric membrane.

145 322. (New) The fuel cell electrode of claim 317 wherein

said support has a surface area; and,
substantially all of said surface area ionically communicates with an ionomeric
membrane.

1410 323. (New) The fuel cell electrode of claim 318 wherein
said support has a surface area; and,

substantially all of said surface area ionically communicates with an ionomeric
membrane.

147 324. (New) The fuel cell electrode of claim 319 wherein
said support has a surface area; and,

substantially all of said surface area ionically communicates with an ionomeric
membrane.

148 325. (New) The fuel cell electrode of claim 317 wherein said carbon catalyst
support comprises a material selected from the group consisting of a carbon filament
bundle, reticulated carbon, carbon cloth, and carbon mesh.

149 326. (New) The fuel cell electrode of claim 319 wherein said carbon catalyst
support comprises a material selected from the group consisting of a carbon filament
bundle, reticulated carbon, carbon cloth, and carbon mesh.

150 327. (New) The fuel cell electrode of claim 317 wherein said carbon catalyst
support comprises a material selected from the group consisting of a carbon cloth and a
coating on a carbon cloth selected from the group consisting of carbon, a wet proofing
material, and a combination thereof.

151 328. (New) The fuel cell electrode of claim 319 wherein said carbon catalyst
support comprises a material selected from the group consisting of a carbon cloth and a
coating on a carbon cloth selected from the group consisting of carbon, a wet proofing
material, and a combination thereof.

152 329. (New) The fuel cell electrode of claim 320 wherein said ionomeric
membrane comprises a composite of polytetrafluoroethylene comprising impregnated ion
exchange media.

153 330. (New) The fuel cell electrode of claim 329 wherein said composite
comprises a thickness of about 1 μm .

154 331. (New) The fuel cell electrode of claim 321 wherein said ionomeric membrane comprises a composite of polytetrafluoroethylene comprising impregnated ion exchange media.

155 332. (New) The fuel cell electrode of claim 331 wherein said composite comprises a thickness of about 1 μm .

156 333. (New) The fuel cell electrode of claim 322 wherein said ionomeric membrane comprises a composite of polytetrafluoroethylene comprising impregnated ion exchange media.

157 334. (New) The fuel cell electrode of claim 333 wherein said composite comprises a thickness of about 1 μm .

158 335. (New) The fuel cell electrode of claim 323 wherein said ionomeric membrane comprises a composite of polytetrafluoroethylene comprising impregnated ion exchange media.

159 336. (New) The fuel cell electrode of claim 335 wherein said composite comprises a thickness of about 1 μm .

160 337. (New) The fuel cell electrode of claim 324 wherein said ionomeric membrane comprises a composite of polytetrafluoroethylene comprising impregnated ion exchange media.

161 338. (New) The fuel cell electrode of claim 337 wherein said composite comprises a thickness of about 1 μm .

162 339. (New) A membrane electrode assembly comprising the fuel cell electrode of claim 363.

163 340. (New) A membrane electrode assembly comprising the fuel cell electrode of claim 310.

164 341. (New) A membrane electrode assembly comprising the fuel cell electrode of claim 329.

165 342. (New) A membrane electrode assembly comprising the fuel cell electrode of claim 330.

166 343. (New) A membrane electrode assembly comprising the fuel cell electrode of claim 332.